

High transparent acrylic polymer binder for smart highway with glowing lines

Gyu Hyeok Lee, Ju Hong Lee, Jongchan Won, Ji-Hong Bae, and PilHo Huh*

Dept. of Polymer Science and Engineering, Pusan National University, Busan 609-735, Korea

* pilho.huh@pusan.ac.kr

Abstract

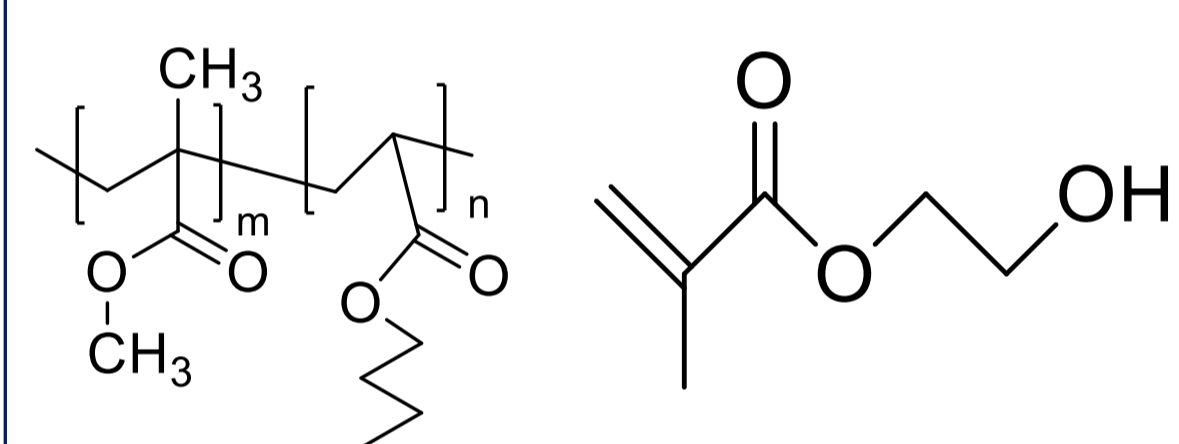
Acrylic polymer binders with high transparency and water resistance were blended on various ratio using PMMA(Poly methyl methacrylate), 2-HEMA(2-Hydroxyethyl methacrylate), PTE, BPO(Benzoyl peroxide) and silane. Designed acrylic polymer binders with siloxane were cured by using BPO/PTE Redox initiating system(ROIS). Various properties to apply as acrylic binder were studied through universal test machine(UTM), UV-visible spectrophotometer(UV-vis), contact angle meter. The binder exhibited high high adhesion strength, transparent properties, high gel fraction.

Objective

According to monomer contents

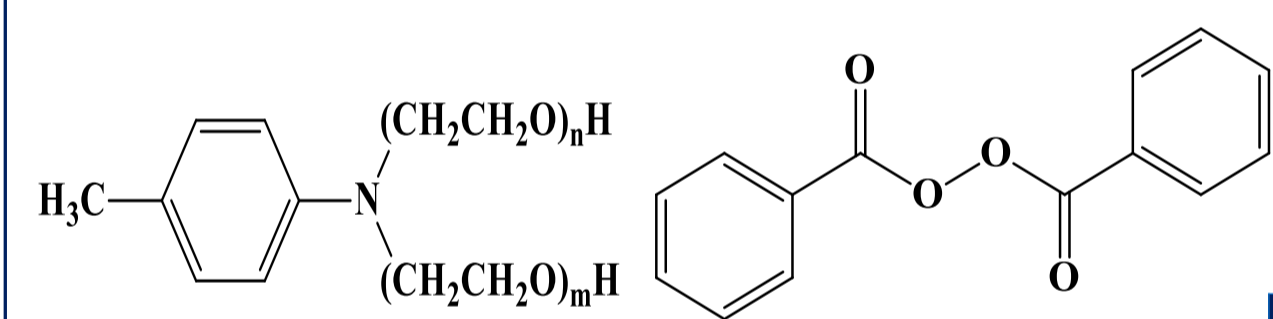
1. Characteristics comparison of optical properties.
2. Characteristics comparison of shear stress.
3. Characteristics comparison of wettability.

Materials



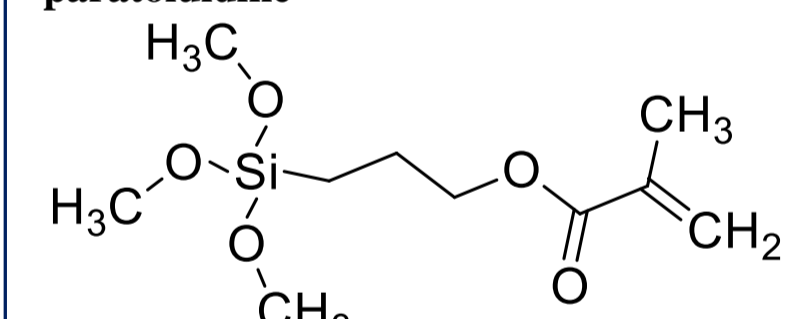
PMMA
Polymethyl methacrylate
[MMA,BAM copolymer]

2-HEMA
2-Hydroxyethyl methacrylate

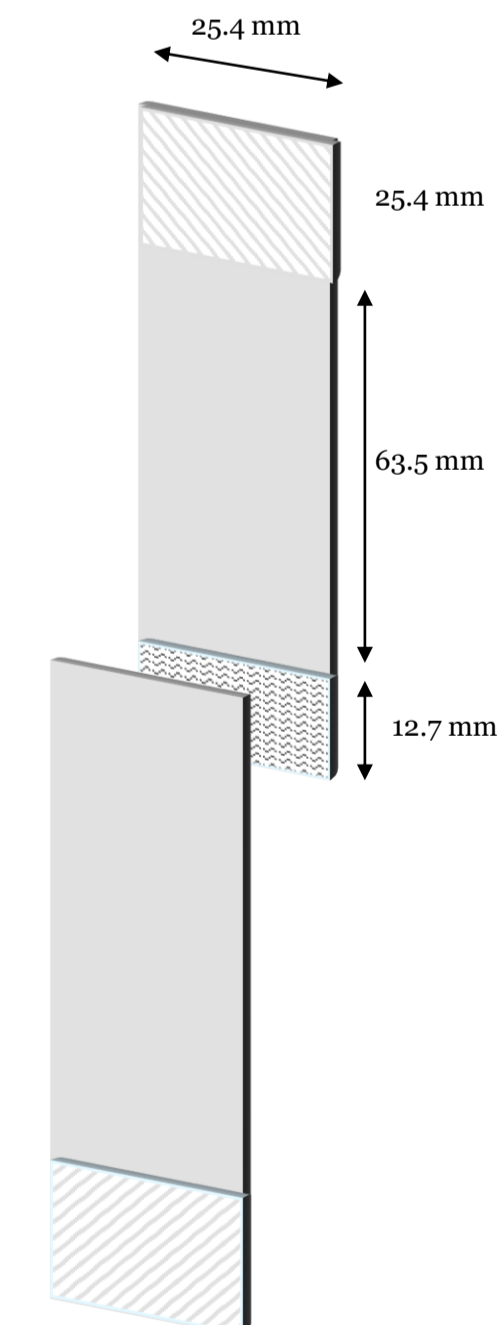


PTE
N,N-Bis(2-hydroxyethyl)-
paratoluidine

BPO
Benzoyl peroxide



TMSPMA
3-(Trimethoxysilyl)propyl
methacrylate



ASTM D1002 specimen

Experimental

Step 1 Blend Acrylic monomer and catalyst

Step 2 Add initiator and Stir

Step 3 Apply adhesive to specimen

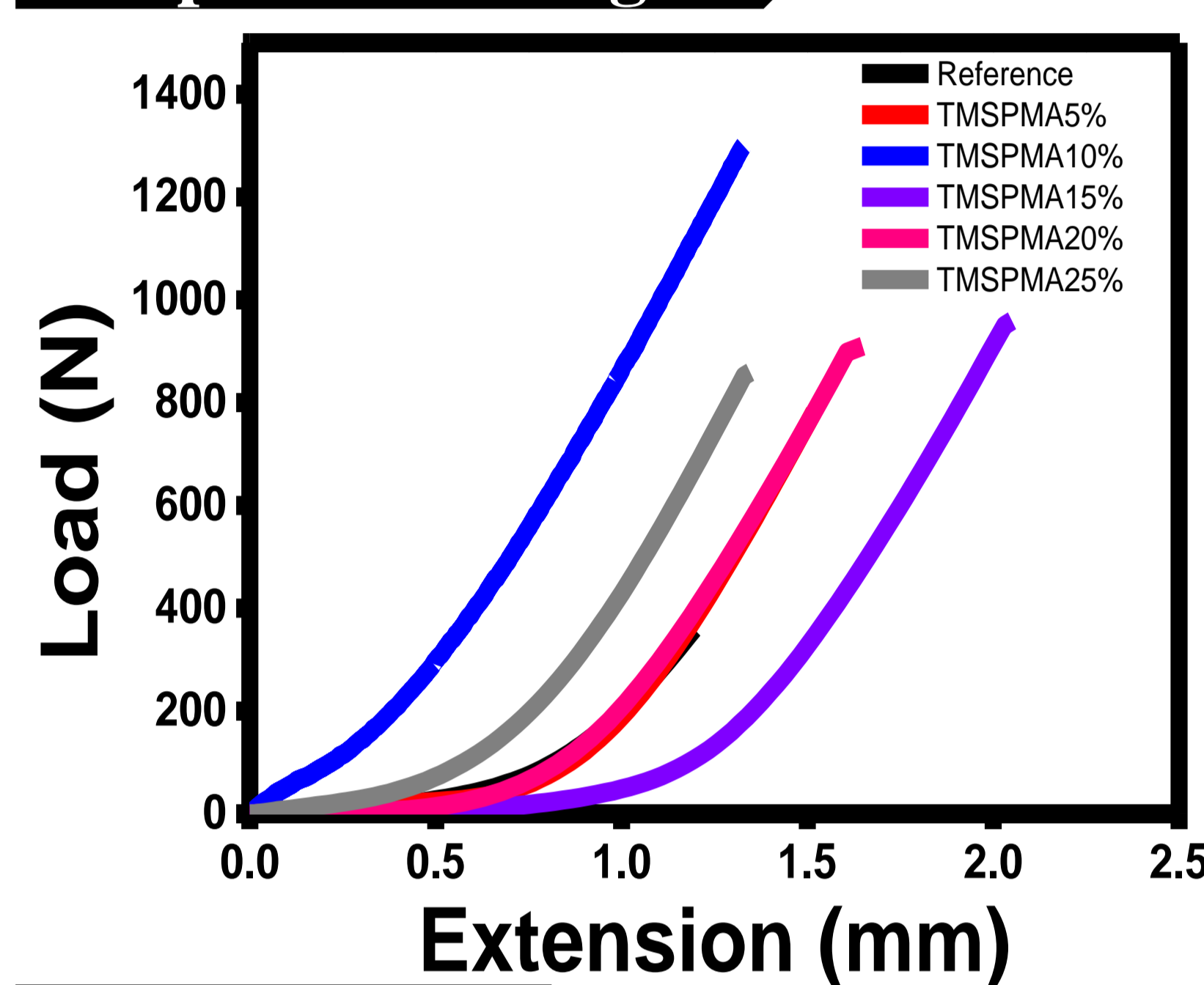
SAMPLE	Reference (wt%)	TMSPMA (wt%)
Reference	100	0
TMSPMA 5%	95	5
TMSPMA 10%	90	10
TMSPMA 15%	85	15
TMSPMA 20%	80	20
TMSPMA 25%	75	25

Test condition

- Temperature : Room temperature
- Loading speed : 1.3 mm/min

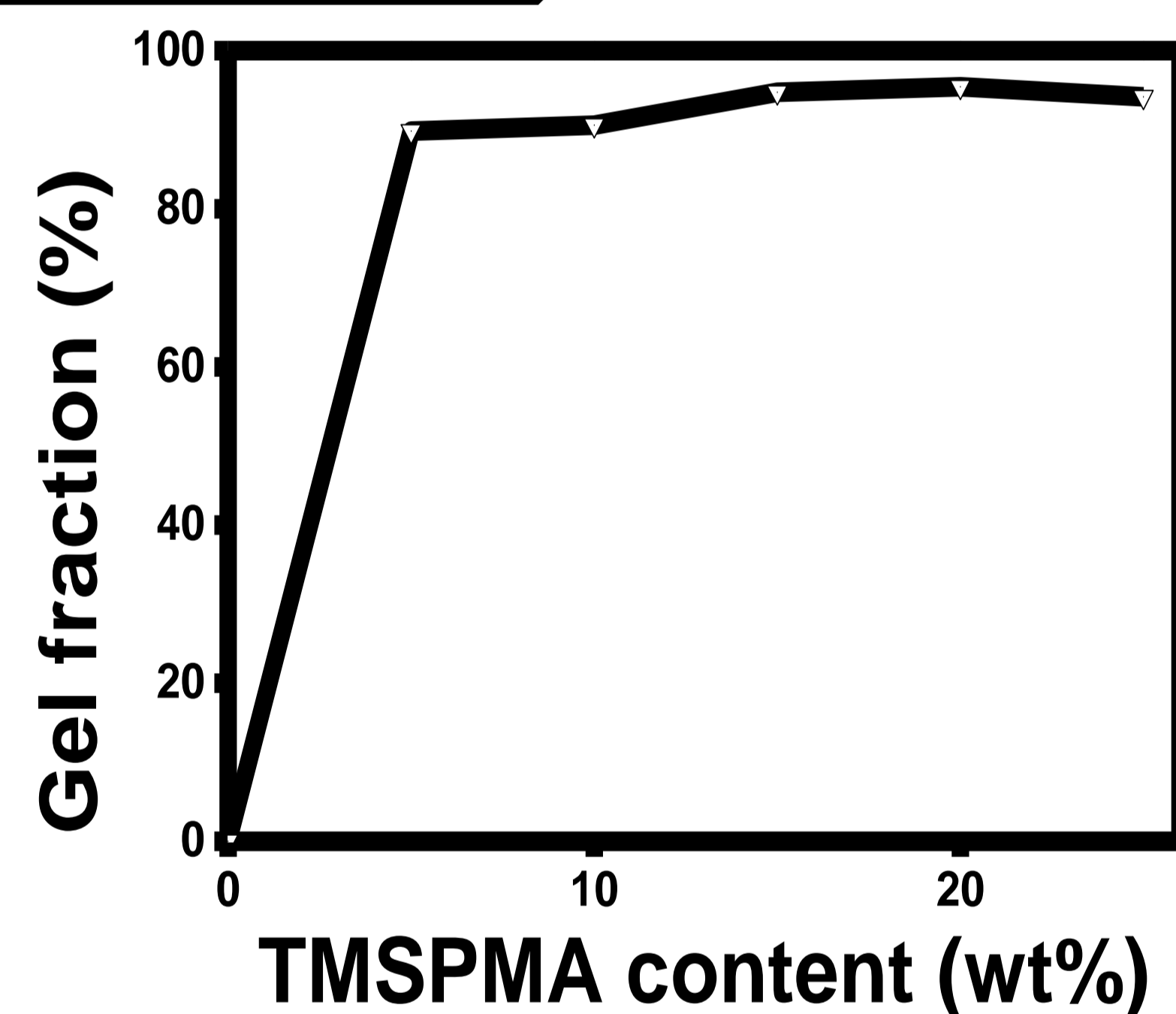
Results

Lap shear strength



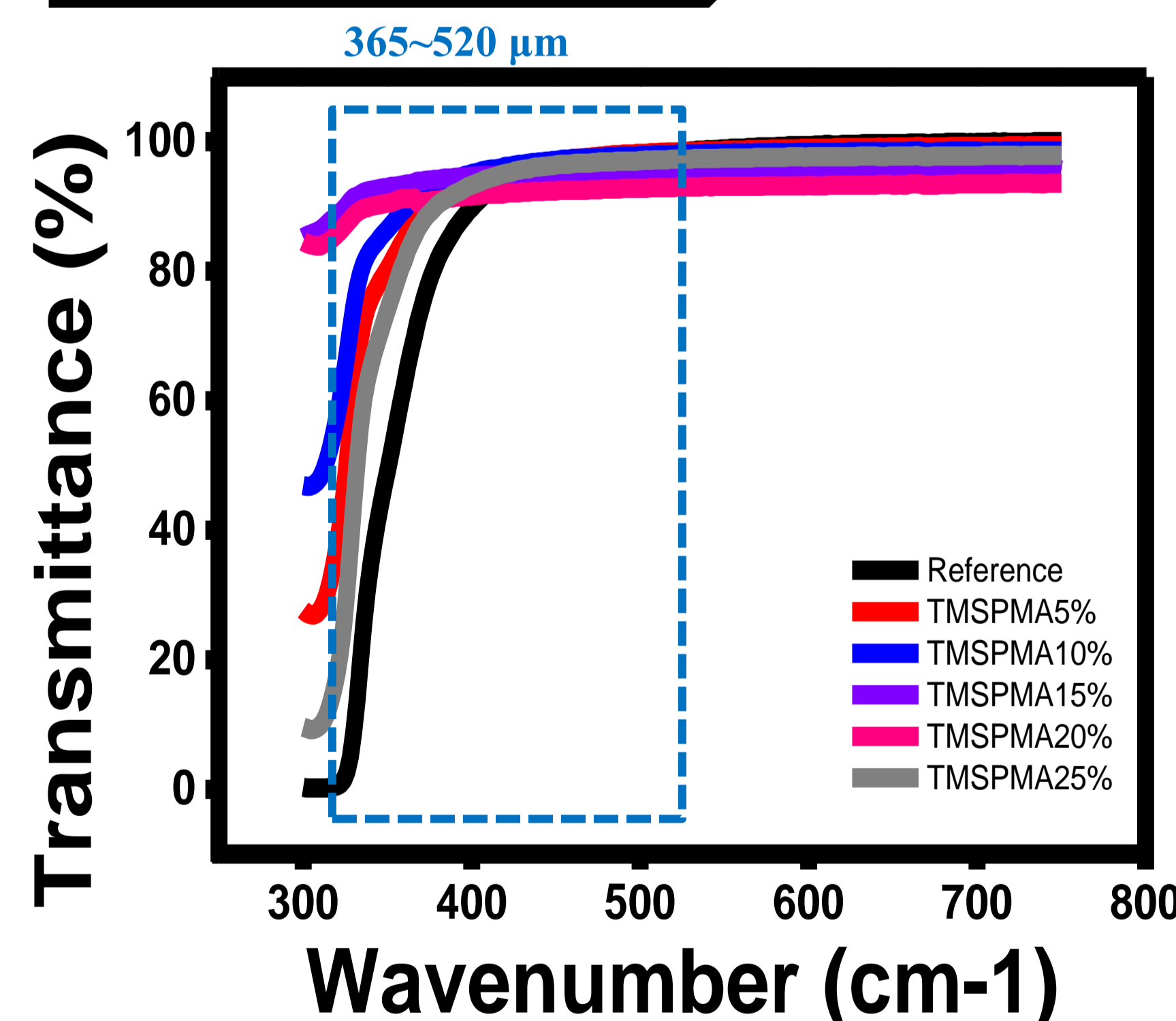
	Stress (Mpa)
Reference	1.11
TMSPMA 5%	2.42
TMSPMA 10%	4.03
TMSPMA 15%	2.97
TMSPMA 20%	2.82
TMSPMA 25%	2.66

Gel fraction

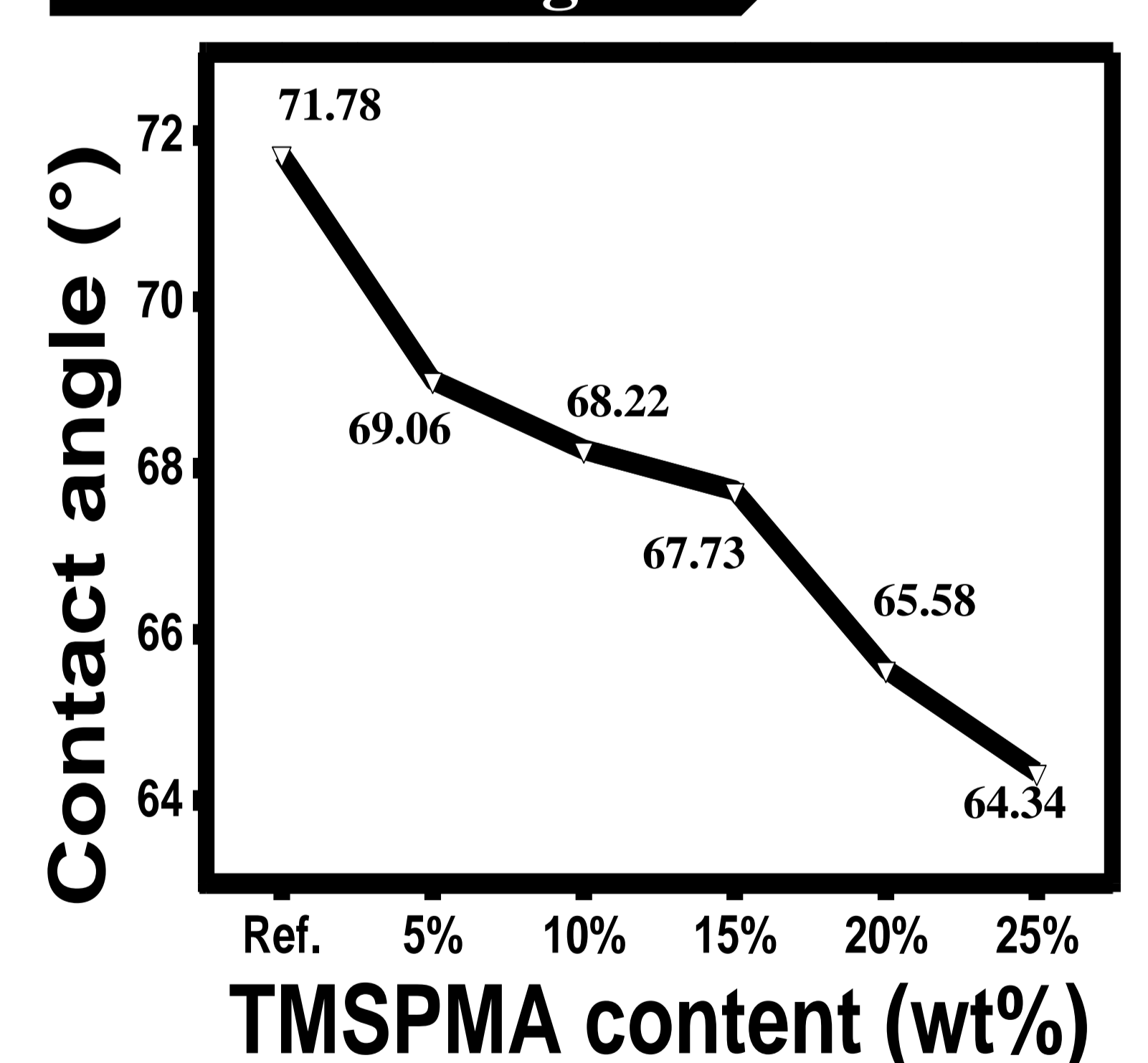


	Gel rate (%)
TMSPMA 5%	89.83
TMSPMA 10%	90.56
TMSPMA 15%	94.75
TMSPMA 20%	95.44
TMSPMA 25%	94.16

Transmittance



Contact angle



Conclusion

- TMSPMA forms high gel fraction in acrylate resin.
- TMSPMA shows improvement of transmittance in the range of 370nm-520nm of wavelength.
- As the content of TMSPMA increased, the contact angle decreased.
- Due to crosslink and hydrogen bonds, TMSPMA promotes shear stress(MPa). <4.03 Mpa>
- Results of estimation of various characteristics, proper content of TMSPMA is important.

Acknowledgement

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